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EFFECTIVENESS OF PLATELET RICH PLASMA INJECTION AND CORTICOSTEROID INJECTION ON FUNCTIONAL OUTCOME IN SUBJECTS WITH PERIARTHRITIS SHOULDER

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ABSTRACT Periarthritis shoulder (PA) affects the glenohumeral (GH) joint and limits active and passive range of motion because of adhesions and fibrosis in the GH capsule, which decreases joint space. Previous study reported as both triamcinolone injection and Platelet Rich Plasma (PRP) injection are equally effective in the pain reduction and improving shoulder Range Of Motion. However, functional outcome was not measured.

Hence, the objective of the study was to compare the efficacy of local autologous Platelet rich Plasma injection and local triamcinolone injection in patients with Periarthritis shoulder in terms of functional outcome. This was a prospective study conducted in patients with USG confirmed Periarthritis shoulder who attended Department of Physical Medicine and Rehabilitation, Government Medical College Kottayam. 30 subjects were allotted in each group. Shoulder Pain and Disability Index (SPADI) was measured before and after 6 weeks of injection. It was observed that PRP group had better functional outcome in SPADI in terms of pain, disability and total score.

KEYWORDS : Periarthritis shoulder, Platelet rich Plasma injection, local triamcinolone injection

INTRODUCTION

Periarthritis shoulder is also known as Adhesive capsulitis or Frozen shouder. The term Frozen shoulder was first described in 1934 by Codman. Frozen shoulder affects the glenohumeral (GH) joint and limits active and passive range of motion because of adhesions and fibrosis in the GH capsule, which decreases joint space[1]. It usually affects the age group 40 to 70 years[2]. It is a self limiting disorder[2] characterised by insidious onset of progressive pain and gradual decrease in active and passive Range Of Motion[3].

Periarthritis shoulder is divided into four stages[4]. Stage 1 is characterised by pain with shoulder movements but no significant glenohumeral ROM restriction when examined under anaesthesia. Stage 2, also known as freezing stage, is characterised by pain with shoulder motion and progressive glenohumeral joint ROM restriction in forward flexion, abduction and internal and external rotation. Stage 3 or the frozen stage is characterised by significant reduction in pain but maintenance of the restricted glenohumeral joint ROM. In stage 4, also known as the thawing stage, the ROM gradually improves.

Periarthritis shoulder is a clinical diagnosis, however laboratory and imaging studies can be used to rule out other conditions. Main treatment goal is to relieve pain and restore movement and shoulder function. Physiotherapy and home exercise are the first-line treatments. Medications include NSAIDs, anti-depressant medications and corticosteroid injection[4]. Platelet Rich Plasma (PRP) has a platelet concentration higher than that of whole blood, and is thought to stimulate a natural healing process[5] and showed improvement in the ROM and functional improvement[1] as studied by Aslani et al. Surgery has not been shown to improve outcomes.

Though both local corticosteroid injection and local PRP injection can be used as treatment,the efficacy of one over other in terms of functional outcome has not studied yet. So we attempted here to study the comparative efficacy of PRP injection and corticosteroid injection in the treatment of PA using the scale SPADI.

METHODS

This was a prospective study done in patients with USG confirmed Periarthritis shoulder who attended Department of Physical Medicine and Rehabilitation, Government Medical College, Kottayam. The study was approved by our Institutional Review Board. An informed consent form (available in local language also) was signed by all the subjects before they participated in the study.

Our study included patients belonging to the age group 40 - 70 years, who was suffering from shoulder pain for atleast one month and who lost more than one-third of active shoulder flexion, abduction, internal rotation and external rotation, who had normal anteroposterior radiographs of the glenohumeral joint in neutral rotation and whose diagnosis was confirmed with USG (to rule out rotatorcuff tendinitis ,tear etc)

Our study excluded patients with intrinsic glenohumeral joint pathology and tendon rupture, past history of shoulder trauma or surgery, evidence of complex regional pain syndrome, history of injection in the involved shoulder joint during the last 6 months, patients with blood dyscrasias or who take antiplatelet or anticoagulant medication, patients having cardiovascular, renal or hepatic problems, pregnancy and lactation, malignancy, severe anaemia (Hb<5gm%) and diabetic patients with FBS >110 and PPBS >140.

According to a study named comparative efficacy of Platelet Rich Plasma and Corticosteroid injection in treatment of Periarthritis shoulder done by Shashank Yeshwant Kothari, Venkataraman Srikumara and Neha Singh[2], it was observed that a single injection of PRP resulted in significant improvement in shoulder range of motion, pain and function as compared to Corticosteroid injection.

The sample size calculation is based on the ability to detect a difference between treatment groups of ≥13 points in the total SPADI scores. This is based on the study of Schmitt[6] which describes a minimal clinical important difference (MCID) of 13. The study of Carette[7] shows a standard deviation of 17 on the SPADI. Based on these parameters, sample size was calculated of 27 subjects per group with a power of 80%, alpha 0.05. The sample size is calculated using the formula

$$n = \frac{\sigma^2 \left(z_{1-\beta} + z_{1-\alpha/2} \right)^2}{(\mu_0 - \mu_1)^2}$$

So a sample of 30 subjects per group were included in the study.

Details of the patients including name, age, sex, address, educational status, occupation, diabetic status were collected. A written informed consent was obtained. History and clinical examinations were done. Basic investigations were done. Information collected were recorded in the pre-prepared proforma .Tool used to compare the effectiveness of the treatments was SPADI.

The Shoulder Pain And Disability Index (SPADI) was developed to measure shoulder pain and disability. The SPADI contains 13 items that assess 2 domains, a 5 item subscale that measures pain and an 8 item subscale that measures disability[8]

Two groups were formed with group A receiving local triamcinolone

injection and group B receiving autologous Platelet Rich Plasma injection. The patients were categorised in each groups on alternate basis. The patient was prepared in a standard aseptic fashion and sterile technique was used throughout the procedure. A 24 G 1 ½ inch needle was inserted medial to the head of humerus, lateral to the coracoid process by 1cm and was directed posteriorly at a slight superior and lateral angle. The needle should slip into the joint completely without any resistance. After negative aspiration a 2ml mixture of 40 mg of triamcinolone acetonide and local anaesthetic 2% lignocaine was injected.

PRP preparation and injection

According to the American Association of Blood Banks technical manual, "platelet-rich plasma is separated from whole blood by 'light-spin' centrifugation and subsequently the platelets are concentrated by 'heavy-spin' centrifugation with removal of the supernatant plasma."

The centrifugation process separates blood components based on their different specific gravities, i.e., RBCs being the heaviest, followed by WBCs, and platelets the lightest. The first centrifugation is slow to isolate plasma. Platelets are mostly concentrated right on top of the buffy coat layer. Subsequent centrifugation is faster, so that platelets are spun down and separate as a pellet at the bottom of the tube from platelet-poor plasma (PPP) above. The final platelet concentration depends on the volume reduction of PPP. Approximately 3/4 of the supernatant is discarded and the platelet-rich pellet is re-suspended in remaining amount of plasma. The resulting suspension is used as PRP.

Under aseptic precautions, 18ml of blood is drawn from patients belonging to group B via venepuncture using a 22 gauge needle and mixed with 2ml of anticoagulant Citrate Phosphate Dextrose in a sterile test tube. It is centrifuged at 160G (1500rpm) for 10mins in a manual centrifuge machine. Aspirate plasma and buffycoat and is transferred to another sterile test tube. It is then centrifuged at 400G (2500rpm) for 10mins. Approximately ¾ of the supernatant is discarded and the platelet rich pellet is resuspended in remaining amount of plasma. This PRP sample is injected into the affected shoulder by anterior approach which was then dressed.

Both groups were followed up prior to injection and after 6 weeks of injection.. At each of these follow up visits SPADI was applied as assessment tool. The results were then analyzed statistically.

Data analysis was performed by SPSS (version 17) for windows. Alpha value was set as 0.05. Descriptive statistics was performed to find out mean, standard deviation for the demographic variable and outcome variables. Unpaired t test was used to find out significant differences among demographic variable such as age. Chi square test was used to find out gender distribution among both groups. Mann Whitney U test was used to find out significant differences among baseline data of the outcome variable such as Pain, Disability and Total score. Wilcoxon signed rank sum test was used to find out difference in scores within groups for Pain, Disability and Total score. Microsoft excel, word was used to generate graph and tables.

ANALYSIS AND RESULTS

Total subjects included in the study was sixty. 30 in steroid group and 30 in PRP group. The data related to each group, before starting treatment, and at sixth weeks of treatment were collected and analysed statistically.

In the Group A, the mean age is 55.70 and standard deviation (sd) is 9.64 and in the Group B, the mean age is 53.40 and sd is 8.81 which was not statistically significant (p value >0.338). In the Group A, there were 13 males & 17 females and in the Group B, there were 16 males & 14 females which were not statistically significant (Þ-value >0.438). In summary data were homogenous among both groups.

In the Group A, the mean Pain was 79.33 with standard deviation of 10.00 and in the Group B, the mean Pain is 81.33 with standard deviation of 9.42 which was not statistically significant (Þ-value >0.617).In the Group A, the mean Disability was 73.25 with standard deviation of 11.19 and in the Group B, the mean Disability is 75.46 with standard deviation of 10.69 which was not statistically significant (Þ-value >0.472).In the Group A, the mean total score was 75.59 with standard deviation of 10.24 and in the Group B, the mean total score was 77.64 with standard deviation of 9.31 which was not statistically significant (Þ-value >0.490). In summary data were homogenous among both groups.

In the Group A, the Pain score reduced from 79.33 with standard deviation of 10.00 to post Pain score of 66.67 with standard deviation of 10.54 which was statistically significant (p value <0.00001).In the Group A, the Disability score reduced from 73.25 with standard deviation of 11.19 to post Disability score of 61.33 with standard deviation of 10.82 which was statistically significant (p value <0.00001).In the Group A, the total score reduced from 75.59 with standard deviation of 10.24 to post total score of 63.38 with standard deviation of 10.18 which was statistically significant (p value <0.00001).

In the Group B, the Pain score reduced from 81.33 with standard deviation of 9.42 to post Pain score of 56.80 with standard deviation of 10.99 which was statistically significant (p value <0.00001).In the Group B, the Disability score reduced from 75.46 with standard deviation of 10.69 to post Disability score of 51.04 with standard deviation of 11.45 which was statistically significant (p value <0.00001).In the Group B, the total score reduced from 77.64 with standard deviation of 9.31 to post total score of 53.26 with standard deviation of 10.56 which was statistically significant (p value <0.00001).

However when comparing between group the mean Pain post score in Group A was 66.67 with a standard deviation 10.54 and the mean Pain post score in Group B was 56.80 with a standard deviation 10.99 which was statistically significant (p value <0.003). The mean Disability post score in Group A was 61.33 with a standard deviation 10.82 and the mean Disability post score in Group B was 51.04 with a standard deviation 11.45 which was statistically significant (p value <0.002). The mean total post score in Group A was 63.38 with a standard deviation 10.18 and the mean total post score in Group B was 53.26 with a standard deviation 10.56 which was statistically significant (p value <0.001). In summary group B was better compared to group A in reducing SPADI total score and its components.

DISCUSSION

Periarthritis shoulder is usually debilitating and influences every aspect of a patient's life. There are both invasive and non invasive treatment options available for this condition. Oral medications includes NSAIDs and Glucocorticoids[4].

Oral glucocorticosteroids can be prescribed in lieu of NSAIDs, as they provide a stronger anti-inflammatory effect, however they should not be given routinely due to their potential adverse effects[9,10,11]. Cataract, glaucoma, osteoporosis, peptic ulcer, Cushing's syndrome, limb muscle atrophy, growth retardation are some of the adverse effects.

The overall effect of intraarticular corticosteroid is reduction in pro-inflammatory derivatives such as bradykinin, histamine, prostaglandins, and leukotrienes, but is associated with adverse effects such as post injection flare[12,13], skin depigmentation, tissue atrophy, fat necrosis[14], tendon rupture [15,16,17,18,19], avascular necrosis[20] etc.

Platelet Rich Plasma (PRP) derived by centrifuging whole blood, has a platelet concentration higher than that of whole blood, and is thought to stimulate the natural healing process through growth factors contained in the platelets such as platelet derived growth factor, transforming growth factor beta, fibroblast growth factor and insulin like growth factor, initiating and accelerating the natural physiological tissue healing process[5].

Previous study done by us reported as both triamcinolone injection and PRP injection are equally effective in the pain reduction and improving shoulder Range Of Motion. However, functional outcome was not measured.

Hence, the objective of the study was to compare the efficacy of local autologous Platelet rich Plasma injection and local triamcinolone injection in patients with Periarthritis shoulder in terms of functional outcome, visiting the Department of Physical Medicine & Rehabilitation, Government Medical College, Kottayam. Shoulder Pain and Disability Index (SPADI) was measured before and after 6 weeks of injection. It was observed that PRP group had better functional outcome in SPADI in terms of pain, disability and total score.

The limitations of our study are the outcome measure used in this study was more of a subjective than objective nature as they were used to measure pain which is a subjective symptom. Effectiveness of PRP at

different stages of Periarthritis shoulder is not studied. The study would have been done in a large group to get better results. For complete assessment of efficacy of treatments, patients have to be followed up over a longer time. A large, double blind controlled clinical trial would be desirable.

CONCLUSION

The objective of the study was to compare the efficacy of local autologous Platelet rich Plasma injection and local triamcinolone injection in patients with Periarthritis shoulder in terms of functional outcome. It was observed that PRP group had better functional outcome in SPADI in terms of pain, disability and total score.

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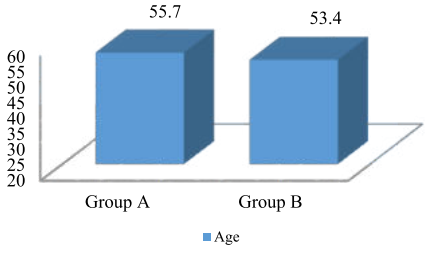
Figures and Tables

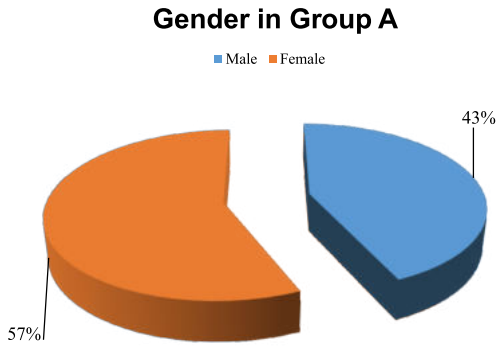
Table I: Baseline data for demographic variables

Sl.No:	Variables	Group A	Group B	Þ-value
1	Age	55.70±9.64	53.40±8.81	>0.338
2	Gender(M/F)	13/17	16/14	>0.438

Graph I: Age



Graph II: Gender in Group A



Graph III: Gender in Group B

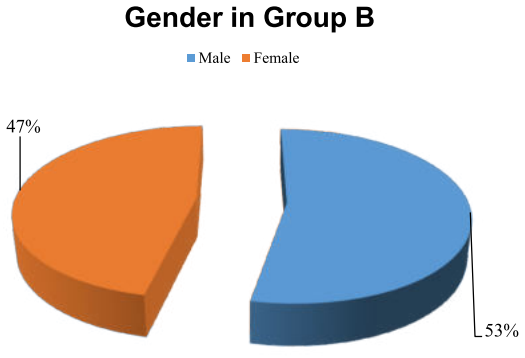
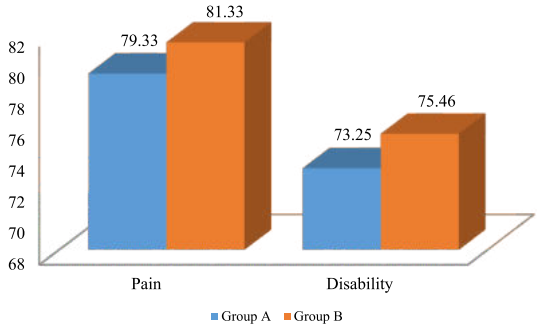


Table II: Baseline data for outcome variables

Sl.No:	Variables	Group A	Group B	Þ-value
1	Pain	79.33±10.00	81.33±9.42	>0.617
2	Disability	73.25±11.19	75.46±10.69	>0.472
3	Total	75.59±10.24	77.64±9.31	>0.490

Graph IV: Pain & Disability



Graph V: Total

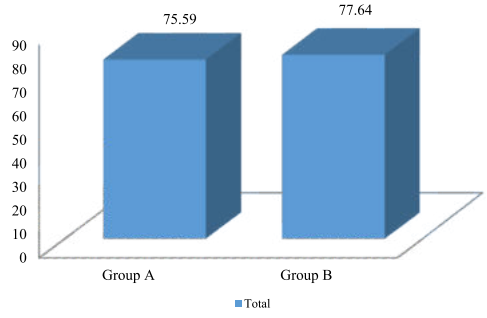


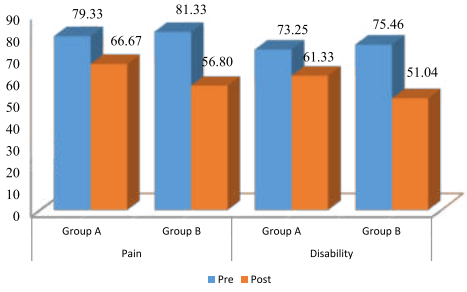
Table III: Pre-post difference within group A

Sl.No:	Variables	Pre	Post	Þ-value
1	Pain	79.33±10.00	66.67±10.54	<0.00001
2	Disability	73.25±11.19	61.33±10.82	<0.00001
3	Total	75.59±10.24	63.38±10.18	<0.00001

Table IV: Pre-post difference within group B

Sl.No:	Variables	Pre	Post	Þ-value
1	Pain	81.33±9.42	56.80±10.99	<0.00001
2	Disability	75.46±10.69	51.04±11.45	<0.00001
3	Total	77.64±9.31	53.26±10.56	<0.00001

Graph VI: Pain & Disability pre-post



Graph VII: Total SPADI pre-post

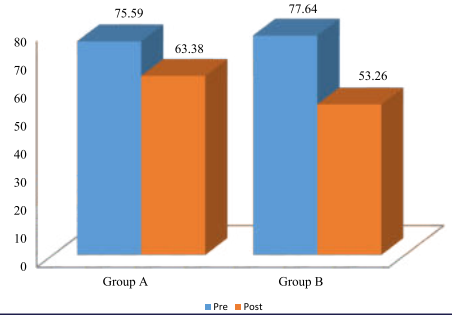
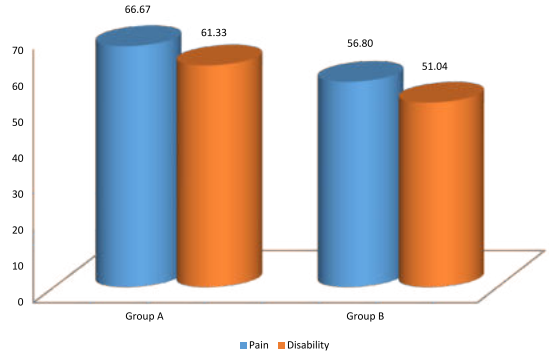


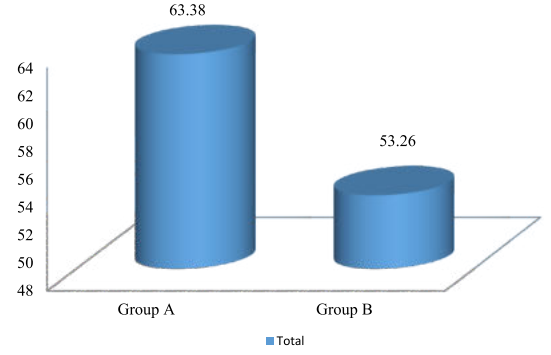
Table V: Difference between groups

Sl.No:	Variables	Group A	Group B	Þ-value
1	Pain	66.67±10.54	56.80±10.99	<0.003
2	Disability	61.33±10.82	51.04±11.45	<0.002
3	Total	63.38±10.18	53.26±10.56	<0.001

Graph VIII: Pain & Disability post score



Graph IX: Total SPADI post



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